

Calendar No. 814

108TH CONGRESS }
2d Session }

SENATE

{ REPORT
108-418 }

NASA AUTHORIZATION ACT OF 2004

R E P O R T

OF THE

**COMMITTEE ON COMMERCE, SCIENCE, AND
TRANSPORTATION**

ON

S. 2541

together with

ADDITIONAL VIEWS



NOVEMBER 19, 2004.—Ordered to be printed

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED EIGHTH CONGRESS

SECOND SESSION

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NOVEMBER 19, 2004.—Ordered to be printed

Mr. MCCAIN, from the Committee on Commerce, Science, and
Transportation, submitted the following

R E P O R T

[To accompany S. 2541]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 2541) to reauthorize and restructure the National Aeronautics and Space Administration, and for other purposes, having considered the same, reports favorably thereon with amendments and recommends that the bill (as amended) do pass.

PURPOSE OF THE BILL

The purpose of the bill, as amended, is to authorize the National Aeronautics and Space Administration (NASA) for Fiscal Year (FY) 2005 through FY 2009. The bill would enact many of the recommendations of the Columbia Accident Investigation Board's report and authorize a program at NASA for human missions to the Moon and Mars.

BACKGROUND AND NEEDS

NASA was created by the National Aeronautics and Space Act of 1958 (P.L. 85-568) to undertake civilian research, development, and flight activities in aeronautics and space. Since its creation, NASA has initiated a wide variety of successful programs and projects including the Apollo landings on the Moon; the development of communications and weather satellites; the sending of planetary probes to every planet in the solar system except Pluto; and research in aeronautics that has improved aircraft performance and safety, and advanced the competitive position of the U.S. aeronautics industry.

The agency is managed from its headquarters in Washington, D.C. It has nine major field centers around the country: Ames Research Center, Moffett Field, California; Dryden Flight Research Center, Edwards, California; Glenn Research Center, Cleveland, Ohio; Goddard Space Flight Center, Greenbelt, Maryland; Johnson Space Center, Houston, Texas; Kennedy Space Center, Cape Canaveral, Florida; Langley Research Center, Hampton, Virginia; Marshall Space Flight Center, Huntsville, Alabama; and Stennis Space Center, in Mississippi, near Slidell, Louisiana. The Jet Propulsion Laboratory, Pasadena, California (often counted as a tenth NASA center), is a federally funded research and development center operated for NASA by the California Institute of Technology. Goddard Space Flight Center manages: the Goddard Institute of Space Studies (New York City, New York); the Independent Validation and Verification Facility (Fairmont, West Virginia); and the Wallops Flight Facility (Wallops, Virginia). Ames Research Center manages Moffett Federal Airfield (Mountain View, California). Johnson Space Center manages the White Sands Test Facility (White Sands, New Mexico). NASA employs approximately 18,700 civil servants (full time equivalents), and 40,000 contractors and grantees working at or near NASA centers.

The Space Shuttle Columbia was launched on its Space Transportation System (STS)-107 mission on January 16, 2003. After completing a 16-day scientific research mission, Columbia started its descent to Earth on the morning of February 1, 2003. As it descended from orbit, approximately 16 minutes before its scheduled landing at Kennedy Space Center, Columbia broke apart over northeastern Texas. All seven astronauts aboard were killed. They were Commander Rick Husband; Pilot William McCool; Mission Specialists Michael P. Anderson, David M. Brown, Kalpana Chawla, and Laurel Clark; and Payload Specialist Ilan Ramon, an Israeli citizen. The last communication with Columbia was at 8:59:32 a.m. EST. The Shuttle was at an altitude of 207,135 feet, traveling at a speed of Mach 18.3 (about 13,000 miles per hour).

On February 1, 2003, Sean O'Keefe, the NASA Administrator, appointed an internal "Mishap Investigation Board" (MIB) led by the NASA Shuttle Program Office, and an external group, the "Space Shuttle Mishap Interagency Investigation Board," to investigate the accident. The "Space Shuttle Mishap Interagency Investigation Board" became the "Columbia Accident Investigation Board" (CAIB). NASA transitioned responsibility for the entire investigation to the CAIB on February 6, 2003. The MIB was replaced by the NASA Accident Investigation Team (NAIT) on March 21, 2003.

The CAIB was chaired by retired Admiral Harold W. Gehman, Jr. of the U.S. Navy. The Board was originally composed of Rear Admiral Stephen Turcotte, Commander, U.S. Naval Safety Center, Norfolk, Virginia; Major General John L. Barry, Director, Plans and Programs, Headquarters Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio; Major General Kenneth W. Hess, Commander, U.S. Air Force Chief of Safety, Kirtland Air Force Base, New Mexico; Dr. James N. Hallock, Aviation Safety Division Chief, U.S. Department of Transportation, Cambridge, Massachusetts; Steven B. Wallace, Director of Accident Investigation, Federal Aviation Administration, Washington, D.C.; Brigadier Gen-

eral Duane Deal, Commander 21st Space Wing, Peterson Air Force Base, Colorado; and Scott Hubbard, Director, NASA Ames Research Center, Moffet Field, California.

Initially, concerns were raised by Members of Congress and the public about the independence of the CAIB. In order to address these concerns, Admiral Gehman worked with Administrator O’Keefe to revise the CAIB charter three times to ensure the panel’s independence (the charter can be found at <http://caib.us/board—charter/default.html>). In addition, the following members were added to the CAIB on February 7 and 15, and March 5: Roger Tetrault, retired Chief Executive Officer of McDermott International; Dr. Sheila Widnall, MIT professor of aeronautics and astronautics and former Secretary of the Air Force; Dr. Sally Ride, physicist and former astronaut; Dr. Douglas Osheroff, Nobel Prize winning physicist; and Dr. John Logsdon, Director of the Space Policy Institute at George Washington University. In addition, Admiral Gehman asked Administrator O’Keefe to substitute ex-officio board member and NASA’s Chief Safety Officer Bryan O’Connor with Michael J. Bloomfield. Lieutenant Colonel Bloomfield is an astronaut who has flown three shuttle missions and a former chief of safety in NASA’s Astronaut Office. He currently serves as chief astronaut instructor.

On August 26, 2003, the CAIB released its report on the causes of the Space Shuttle Columbia accident. The report can be found at <http://caib.us/news/report/default.html>.

The report stated that the physical cause of the loss of the Columbia and its crew was a breach in the Thermal Protection System on the leading edge of the left wing. The breach was initiated by a piece of insulating foam that separated from the left bipod ramp of the External Tank and struck the wing in the vicinity of the lower half of Reinforced Carbon-Carbon (RCC) panel 8 at 81.9 seconds after launch. During re-entry, this breach in the Thermal Protection System allowed superheated air to penetrate the leading-edge insulation and progressively melt the aluminum structure of the left wing, resulting in a weakening of the structure until increasing aerodynamic forces caused loss of control, failure of the wing, and break-up of the Orbiter.

The report also found that the accident was not “an anomalous, random event, but rather likely rooted to some degree in NASA’s history and the human space flight program’s culture.” Based on this reasoning, the CAIB identified organizational causes of the accident. These organizational causes included: “original compromises that were required to gain approval for the Shuttle; subsequent years of resource constraints; fluctuating priorities; schedule pressures; mischaracterization of the Shuttle as operational rather than developmental; and lack of an agreed national vision for human space flight. Cultural traits and organizational practices detrimental to safety were allowed to develop, including: reliance on past success as a substitute for sound engineering practices (such as testing to understand why systems were not performing in accordance with requirements); organizational barriers that prevented effective communication of critical safety information and stifled professional difference of opinion; lack of integrated management across program elements; and the evolution of an informal

chain of command and decision-making processes that operated outside the organization's rules."

In the report, the CAIB discussed the attributes of an organization that could operate the "inherently risky Space Shuttle" more reliably and safely. These attributes included: (1) a robust and independent program technical authority that has complete control over specifications and requirements; (2) an independent safety assurance organization with line authority over all levels of safety oversight; and (3) an organizational culture that "reflects the best characteristics of a learning organization."

The CAIB concluded the report with 29 recommendations. Of these 29 recommendations, 15 are specifically identified as items that must be implemented before "return to flight." These recommendations are largely related to the physical cause of the accident and include improved imaging of the Space Shuttle stack from liftoff through separation of the External Tank, preventing the loss of foam, and the capability to inspect and repair the Thermal Protection System on orbit. The remaining recommendations stem from the CAIB's findings on organizational cause factors. These recommendations include the establishment of an independent Technical Engineering Authority that is responsible for technical requirements and all waivers to them, and reorganization of the Space Shuttle Integration Office to make it capable of integrating all elements of the Space Shuttle program. The report also recommends long-range recommendations to keep the Shuttle flying in the long-term, including the need to develop and conduct a vehicle recertification to operate the Shuttle beyond 2010.

NASA has created a task group chaired by two former astronauts—Thomas Stafford and Richard Covey—and comprised of non-NASA employees. The Stafford-Covey Return to Flight Task Group will have a 2-year charter to assess NASA's implementation of the CAIB recommendations as they relate to operational readiness and safety.

For FY 2005, NASA is requesting \$16.2 billion, a 5.6 percent increase over its FY 2004 appropriation of \$15.4 billion (adjusted for the across-the-board rescission). The overall budget breakdown is represented in Figure 1.

FIGURE 1.—NASA'S FY 2005 Budget Request
(In \$ millions)

Category	FY 2004, Request	FY 2004, approp. (est.)	FY 2005, Request
Exploration, Science, & Aeronautics**	7,661	7,830	7,760
Space Science	4,007	3,971	4,138
Earth Science	1,552	1,613	1,485
Biological & Physical Res.	973	985	1,049
Aeronautics	959	1,034	919
Education	170	22	169
Exploration Capabilities**	7,782	7,521	8,456
Exploration Systems**	1,673	1,646	1,782
Space Launch Initiative	1,065		
Other	607		
Human & Robotic Tech.		679	1,094
Transportation Systems		967	689
Space Flight	6,110	5,875	6,674
Space Station*	1,707	1,498	1,863
Space Shuttle	3,968	3,945	4,319

FIGURE 1.—NASA'S FY 2005 Budget Request—Continued
(In \$ millions)

Category	FY 2004, Request	FY 2004, approp. (est.)	FY 2005, Request
Space Flight Support	434	432	492
Inspector General	26	27	28
TOTAL	15,469	15,378	16,244

Source: NASA FY 2004 and FY 2005 budget justifications. Column totals may not add due to rounding.

* Does not include funding for research conducted aboard the space station, which is embedded in the Biological and Physical Research line. For FY 2004, it is \$578 million, making the total FY 2004 space station request \$2,285 million and final appropriation \$2,085 million. For FY 2005, it is \$549 million, making the total space station request \$2,412 million.

* In FY 2004, "Exploration, Science & Aeronautics" was called "Science, Aeronautics and Exploration"; "Exploration Capabilities" was called "Space Flight Capabilities"; and "Exploration Systems" was called "Crosscutting Technologies".

The major change in NASA's FY 2005 budget request is the President's new national space exploration initiative. Proposed by President Bush on January 14, 2004, the new space vision entitled "A Renewed Spirit of Discovery" calls for NASA to focus its activities on returning astronauts to the Moon in the 2015–2020 time frame, and sending future human space missions to Mars. To accomplish this goal, NASA would terminate the Space Shuttle program in 2010; build a new Crew Exploration Vehicle (CEV) to take astronauts to Earth orbit by 2014 and eventually back to the Moon; restructure the research program for the International Space Station to focus on life sciences research; and build robotic probes that will serve as "trailblazers" for the astronauts.

In late February 2004, NASA released charts providing some detail on the budget assumptions for the new exploration strategy, including a cost estimate of \$64 billion in FY 2003 dollars for landing a crew on the Moon in 2020. This \$64 billion estimate consists of \$24 billion to build and operate the CEV from FY 2004 through FY 2020 and \$40 billion to build the lunar lander portion of the vehicle, a new launch vehicle, and operations.

The President plans to fund the new initiative by redirecting most of the needed funding from other NASA activities, rather than adding significant new funds to the NASA budget. For FY 2005 through FY 2009, NASA says it will "add" \$12.6 billion for the exploration initiative, of which \$1 billion is new funding and \$11.6 billion is redirected from its other activities. The premise is that the nation would spend a certain amount of funding on NASA with or without the new initiative, and that the funding now would be directed primarily towards the exploration initiative, instead of elsewhere. The President is proposing that the NASA budget grow by approximately 5 percent each year for FY 2005 through FY 2007, and then increase by 1 percent each year for FY 2008 through FY 2009. The rate of inflation is assumed by NASA to be 2 percent in future years. A NASA budget chart covering FY 2004 through FY 2020 was released as part of the President's speech that shows a NASA budget that remains level with inflation beyond FY 2009. Between FY 2004 and FY 2020, the percentage of NASA's budget devoted to "exploration" (both human and robotic missions, and the development of nuclear power and propulsion and other technologies) would increase from about 20 percent in FY 2004 to about 75 percent by FY 2020. The total amount of funding represented in the chart appears to be on the order of \$150–170 billion over the 16 year time period. This chart can be found at: <http://www.nasa.gov/pdf/54873main—budget—chart—14jan04.pdf>.

NASA's FY 2005 budget describes the entire NASA request for FY 2005 through FY 2009 (\$87.1 billion) as the budget for the "exploration vision," of which only \$31.4 billion is "exploration specific." In FY 2005, \$4.5 billion of the \$16.2 billion request is "exploration specific." NASA asserts that the FY 2005 budget request and its associated projections for the next four years ("out-year estimates") include an "additional" \$12.6 billion for the exploration initiative, of which \$1 billion is new money, and \$11.6 billion is redirected from other NASA programs. Figure 2 shows the areas which NASA intends to cut as it redirects its functions to support the new space initiative.

FIGURE 2—NASA'S Proposed Reductions to Fund the New Initiative
(In \$ billions)

Activity	2005	2006	2007	2008	2009	Total
Discontinue Space Launch Initiative	-0.8	-1.2	-1.3	-1.2	-1.4	-5.9
Shuttle retirement	0.0	0.0	0.0	-0.2	-1.3	-1.5
Eliminate ISS research not tied to vision	-0.1	-0.2	-0.3	-0.3	-0.3	-1.2
Human Space Flight related reductions (Subtotal)	-0.9	-1.4	-1.5	-1.7	-3.0	-8.6
Defer new space and earth science missions and freeze spending	-0.2	-0.5	-0.7	-0.7	-0.6	-2.7
Reduce space technology and defer institutional activities	-0.15	-0.03	-0.04	-0.05	-0.07	-0.3
Other Reductions (Subtotal)	-0.3	-0.5	-0.7	-0.8	-0.7	-3.0
TOTAL REDUCTIONS	-1.3	-1.9	-2.3	-2.5	-3.7	-11.6

Source: NASA briefing chart, February 5, 2004. Column totals may not add due to rounding.

In addition, Administrator O'Keefe announced that no more Space Shuttle servicing missions would be made to the Hubble Space Telescope, because of Space Shuttle safety concerns in the wake of the Columbia accident. This decision was reviewed by Admiral Harold W. Gehman, Jr., the Chairman of the Columbia Accident Investigation Board, in a March 5, 2004, letter. In a March 17, 2004, letter to Dr. Bruce Alberts, the Chairman of the National Research Council (NRC), Administrator O'Keefe requested assistance in ensuring that NASA has "fully considered all reasonable alternatives" to extending the life span of the Hubble Space Telescope. On July 13, 2004, the NRC responded to NASA's request with an interim report which stated that "there would be little additional investment in time and resources required over the next year for NASA to keep open an option for a human servicing mission to Hubble." The NRC's final report is expected in late 2004.

The NASA FY 2005 request also includes \$4.3 billion for the Space Shuttle program and its Return to Flight activities, and \$1.9 billion for the International Space Station (ISS). President Bush has called for ISS construction to be completed by 2010, after which the Space Shuttle would be retired. NASA estimates that an additional 25 to 30 Space Shuttle launches would be required to meet this objective. By ending the Space Shuttle program, funds would be freed for the new space exploration initiative. NASA's FY

2005 request includes “out-year” projections that reduce the Space Shuttle budget by \$1.5 billion in FY 2008 and FY 2009 to help pay for the exploration initiative. NASA has indicated that the next Space Shuttle flight will occur in May 2005.

On January 30, 2004, President Bush created the President’s Commission on Implementation of United States Space Exploration Policy. The commission was directed to provide recommendations on implementation of the President’s space initiative. Specifically, the Executive Order directed the commission to examine and make recommendations on:

- a science research agenda to be conducted on the Moon and other destinations;
- the exploration of technologies, demonstrations, and strategies to be used for sustainable human and robotic exploration;
- the criteria to select future destinations for human exploration;
- the long-term organization options for managing space exploration activities;
- the appropriate roles for private sector and international participation;
- the methods for using space exploration to encourage greater interest by American students in studying and pursuing careers in mathematics, science, and engineering; and
- the management of the new initiative’s implementation within available resources.

The Commission released its final report on June 16, 2004 and can be found at the website: <http://www.moontomars.org/>. The findings and recommendations of the report cover the following areas:

- space exploration managed as a national priority;
- a “go as you can pay” approach for funding;
- transformation of NASA organization and management processes;
- NASA centers operated as Federally Funded Research and Development Centers;
- special project teams to develop “enabling technologies”;
- increased incentives and prizes for private sector investment;
- scientific achievements that lead to further scientific knowledge; and
- stimulation of science, math and engineering education for students and teachers.

LEGISLATIVE HISTORY

S. 2541 was introduced on June 17, 2004 by Senator McCain, and is co-sponsored by Senators Brownback, Hutchison, and Allen. S. 2541 was referred to the Committee on Commerce, Science, and Transportation on June 17, 2004. Hearings on NASA and its programs were held on February 12, 2003, April 2, 2003, May 14, 2003, June 3, 2003, September 3, 2003, October 29, 2003, November 6, 2003, January 28, 2004, February 18, 2004, March 10, 2004, April 4, 2004, April 7, 2004, April 27, 2004, and May 5, 2004. Witnesses included NASA officials, industry representatives, representatives of professional associations, academics, and others with a interest in NASA activities.

On September 22, 2004, the Committee met in open executive session and, by a voice vote, ordered S. 2541 reported with five amendments. Amendments were offered by Senators McCain, Hutchison, Nelson and Burns. Senator McCain's amendment would make technical corrections to the bill. The amendment also would call for a status report on Shuttle upgrades, extend the requirements for a commercialization plan and industrial assessments to include the Earth Science Applications program, and delete sections on electronic access to business opportunities and retrocession of jurisdiction.

Senator Hutchison's amendment would require the Administrator to submit a report, including cost and scheduling, for enabling the extension of the Shuttle operations and maintenance until project Constellation Exploration Transportation system has been tested with humans. It also contains a Sense of the Senate that says NASA should take all steps necessary to have a human rated vehicle before ceasing Space Shuttle operations.

Senator Burns amendment would set aside authorization funding for the Experimental Program to Stimulate Competitive Research (EPSCoR) program from within the Education program. The EPSCoR program supports competitively selected universities in designated States to build their research capacity in areas important to NASA. The EPSCoR program would be authorized at \$12 million for FY2005, \$15 million for FY2006, \$15 million for FY2007, \$20 million for FY2008, and \$20 million for FY2009.

Senator Nelson offered two amendments. The first amendment would require NASA to fully comply with all of its commitments to the International Space Station. The amendment would also require the Administrator to report to Congress within 120 days of enactment to identify options for increasing the crew size of the International Space Station to six. The report would include an assessment of the cost, schedule, and logistics requirements for each option. The second would authorize the Administrator to carry out a program to retain personnel from the Space Shuttle program to minimize the loss of critical skills and expertise within NASA. The Administrator would be required to submit a report on the program along with an assessment of the funding required to carry out the program.

ESTIMATED COSTS

In compliance with subsection (a)(3) of paragraph 11 of rule XXVI of the Standing Rules of the Senate, the Committee states that, in its opinion, it is necessary to dispense with the requirements of paragraphs (1) and (2) of that subsection in order to expedite the business of the Senate.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported:

NUMBER OF PERSONS COVERED

S. 2541, as reported, would reauthorize appropriations for NASA fiscal years 2005, 2006, 2007, 2008, and 2009. NASA conducts a

number of scientific research and development activities concerning aeronautics, earth science, space science, and space exploration. The Committee believes that the bill will not subject any individuals or businesses affected by the bill to any additional regulation.

ECONOMIC IMPACT

This legislation would not have an adverse impact on the Nation. The legislation would sufficient authorization levels to sustain ongoing and new awards, cooperative agreements, and contracts in the space community. Section 305 would require a commercialization plan to support human missions to the Moon and Mars along with Earth science mission and applications. Section 309 would establish a Technology Transfer and Licensing Office to facilitate the transfer of technologies into and out of the agency.

PRIVACY

This legislation would not have a negative impact on the personal privacy of individuals.

PAPERWORK

This legislation would not increase the paperwork requirement for private individuals or businesses. There are numerous reports that would be required of NASA. These reports include such topics as: independent Technical Engineering Authority; recertification and upgrades of the Shuttle; resupply of the International Space Station; system requirements documents for human missions to the Moon and Mars; and spending levels for aeronautics research.

SECTION-BY-SECTION ANALYSIS

Section 1. Short title; table of contents.

Subsection (a) would entitle the Act as the “NASA Authorization Act of 2004.”

Section 2. Definitions.

Section 2 would define the key terms, “Administrator” and “NASA.”

Section 3. Findings.

Section 3 would identify key findings of the bill concerning the history, the future, and the value of programs at NASA.

TITLE I—AUTHORIZATION OF APPROPRIATIONS

Section 101. Exploration capabilities.

Section 101 would authorize funding in the following areas: (1) International Space Station; (2) Space Shuttle; (3) Space Flight Support; (4) Transportation Systems; and (5) Human and Robotic Technology. The funding amounts for each of these areas for FY 2005 through FY 2009 are as shown in Figure 3.

FIGURE 3—Authorization Levels
(In \$ millions)

	FY 05	FY 06	FY 07	FY 08	FY 09
Exploration Capabilities					
International Space Station	1,863	1,764	1,780	1,779	2,115
Shuttle	4,319	4,326	4,314	4,027	3,030
Space Flight Support	492	435	430	456	453
Transportation Systems	689	1,261	1,624	1,423	1,863
Human and Robotic Tech.	1,079	1,303	1,301	1,370	1,433
Exploration and Aeronautics					
Space Science	4,138	4,404	4,906	5,520	5,561
Earth Science	1,485	1,390	1,368	1,343	1,474
Biological/Physical Research	1,049	950	938	941	944
Aeronautics Technology	919	957	938	926	942
Education	169	169	171	170	170
Inspector General	28	29	30	31	32
TEA	15	16	16	16	17
TOTAL	16,245	17,003	17,816	18,002	18,034

Section 102. Exploration, science, and aeronautics.

Section 102 would authorize funding in the following areas: (1) Space Science; (2) Earth Science; (3) Biological and Physical Research; (4) Aeronautics Technology; and (5) Education. The funding amounts for each of these areas for FY 2005 through FY 2009 are as shown in Figure 3.

Section 103. Inspector general.

Section 103 would authorize the Office of the Inspector General for FY 2005 through FY 2009 at the levels as indicated in Figure 3.

Section 104. Independent technical engineering authority.

Section 104 would authorize the independent Technical Engineering Authority for FY 2005 through FY 2009 at the levels as indicated in Figure 3.

Section 105. Total authorizations.

Section 105 would provide the total authorization levels for NASA for FY 2005 through FY 2009 and are as shown in Figure 3. The bill would provide authorizations for a total of five years for NASA. Many research projects involved several years of effort before results can be realized. The Committee acknowledges that many things can change within a five year period. Nevertheless, the Committee is concerned that NASA has not continued its support for certain research areas for the entire duration of the authorization period. During the previous NASA authorization act

(P.L. 106–391), authorization was included for immediate clinical trials for islet transplantation in patients with Type I diabetes utilizing immunoisolation technologies derived from NASA space flights. NASA funded the initial research into this area but failed to provide all of the authorized levels prescribed by the authorization legislation. The research has progressed successfully while NASA has missed an opportunity to continue its support of a space-based technology for the development of a bio-mechanical system that may be used by medical professionals to treat diabetic patients as well as many other hormone deficient diseases.

TITLE II—SPACE SHUTTLE RETURN TO FLIGHT

Section 201. Lessons-learned program.

Section 201 would require the Administrator to establish an agency-wide lessons-learned and best practices program that would be available to all NASA employees within 180 days of enactment of this Act. The program would include experiences outside of NASA, criteria for determining entries into the program, and a standardized, user-friendly format for data reports.

Section 202. Independent technical engineering authority.

Subsection (a) would require the Administrator within one year of enactment of this Act to establish an independent Technical Engineering Authority (TEA) that would: have its own budgetary line; not have programmatic responsibility for cost and schedule; serve as an agency resource; be responsible for all technical requirements and for developing a system for identifying, analyzing, and controlling hazards throughout the life cycle of the Space Shuttle system or any other relevant programs; and develop a disciplined systematic approach for identifying, analyzing, and controlling hazards throughout the life cycle of the Space Shuttle system or any other designated program at NASA.

Subsection (b) would identify the functions of the Authority.

Subsection (c) would require the Administrator to submit a plan to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science for defining, establishing, transitioning, and implementing the Authority.

Subsection (d) would require the Administrator to annually report on the activities of the Authority as part of its annual budget request.

Section 203. Safety and integration.

Subsection (a) would require the Administrator to provide the Office of Safety and Mission Assurance with independent funding and a direct line authority over the Space Shuttle safety organization. Subsection (b) would require a reorganization by the Administrator of the Space Shuttle Integration Office to ensure that it is capable of integrating all elements of the Space Shuttle program, including the orbiters. Subsection (c) would require the Administrator to submit a plan for accomplishing the requirements of Subsections (a) and (b) within one year to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science.

Section 204. Recertification of the space shuttle.

Subsection (a) would require the Administrator, after approval by Technical Engineering Authority, to recertify the Space Shuttle orbiters prior to continuing operations after 2010. The recertification would be required to be conducted on material, component, subsystem, and system levels and would be part of the Shuttle Service Life Extension program.

Subsection (b) would require the Administrator to submit a costs and scheduling plan to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science before 2009, if it is necessary to operate the Space Shuttle after 2010. The plan would have to be approved by the TEA prior to submission.

Subsection (c) would require the establishment of a long-term program to upgrade the Space Shuttle and International Space Station engineering drawing systems by the Administrator. The upgrade would include a review of drawings for accuracy, conversion of all drawing to a computer-aided drafting system, and incorporation of drawing changes.

Section 205. Return to flight certification.

Section 205 would require the Administrator to certify to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science that all "Return To Flight" safety recommendations of the Columbia Accident Investigation Board Report have been satisfied prior to resuming flights of the Space Shuttle orbiters.

Section 206. Launch plans for international space station.

Section 206 would require the Administrator to submit plans to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science for launching assembly elements, crew, and supplies to the International Space Station from 2010 through 2014.

Section 207. Report on status on upgrades to space shuttle.

Section 207 would require the Administrator to a report to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science on the current status of the upgrades to the Space Shuttle that were recommended for Return To Flight activities for the Space Shuttle program by the Columbia Accident Investigation Board and any other upgrades to improve the safety and reliability of the Space Shuttle fleet.

Section 208. Retention of space launch expertise after retirement of space shuttle.

Subsection (a) would require the Administrator to take appropriate actions to bring the next generation of manned space vehicles into operation as soon as possible after retirement of the Space Shuttle. Subsection (b) would authorize the Administrator to carry out a program to retain personnel from the Space Shuttle program to minimize the loss of critical skills and expertise within NASA if the next generation of manned space vehicles are not in operation within one year after the retirement of the Space Shuttle. Subsection (c) would require the Administrator to submit a report to

the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science on the program authorized by Subsection (b), including an assessment of the funding required to carry out the program and a description of any legislation or administrative actions needed to carry out the program.

The Committee continues to support the safe return to flight of the Space Shuttle. However, the Committee is concerned about NASA's ability to reliably estimate the cost of the return to flight program. The recent increase of over \$400 million for FY 2005 alone and the announcement of another schedule delay in the program has only increased concerns as to whether NASA will be able to return the Shuttle to flight.

The increasing costs of return the Shuttle to flight and completing the International Space Station threatens to reduce future funding for human missions to the Moon and Mars. Simply put, the sooner the space Station is completed, the sooner more funds are available for the new missions to the Moon and beyond.

TITLE III—NASA'S NEW VISION

Section 301. Exploration initiative.

Section 301 would add a new section to the National Aeronautics and Space Act of 1958. Subsection (a) of the new section would authorize a Solar System Exploration Initiative program to: implement a human and robotic exploration program of the solar system and beyond; conduct a human return to the Moon by 2020 in preparation for human exploration of Mars and other destinations; develop innovative technologies, knowledge, and infrastructures to support human exploration missions; and promote international and commercial participation to advance U.S. scientific, security, and economic interests.

Subsection (b) of the new section would require the Administrator to: return the Shuttle to flight; retire the Shuttle system after the Space Station is completed; begin the development of a crew exploration vehicle; and take steps to return humans to the Moon as early as 2015 and no later than 2020.

Section 302. Human missions to the moon.

Subsection (a) would require the Administrator, within 60 days of enactment of this Act, to submit a report to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science on all activities and funding, using full cost accounting, that support human missions to the Moon and Mars in the fiscal year 2005 budget request. Subsection (b) would require the report annually.

Section 303. Systems requirements document.

Subsection (a) would require the Administrator, within 180 days of enactment of this Act, to submit a systems requirements document to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science describing all technical requirements to conduct a mission to the Moon by 2020 and a human mission to Mars. The document would include all baseline requirements and a description of the process for making changes

to the requirements. Subsection (b) requires NASA to submit this report along with the cost estimates as required by Section 304.

Section 304. Life cycle cost estimate.

Subsection (a) would require the Administrator, within 180 days of enactment of this Act, to submit a life cycle cost estimate for a manned mission to the Moon to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science. The cost estimate would also include a determination of the adequacy of funding identified in the FY 2005 budget request.

Subsection (b) would require the Comptroller General to review the life cycle cost estimate from Subsection (a) within 90 days after submission to the Congressional committees. Subsection (c) would require annual updates of the life cycle cost estimate required by Subsection (a). The updated cost estimates would be submitted on or before the President submits the budget of the U.S. to Congress.

Section 305. Commercialization plan with office of space commercialization.

Section 305 would require the Administrator, with the Director of the Office of Space Commercialization of the Department of Commerce, to submit to Congress a commercialization plan that identifies opportunities for the private sector to participate in the human missions to the Moon and Mars and earth science missions and applications. The plan would be required to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science within 180 days of enactment of this Act. Subsection (c) would require that the report be submitted along with the report required by Section 306.

Section 306. Industrial assessment.

Section 306 would require the Administrator, with the Director of the Office of Space Commercialization of the Department of Commerce, to assess the capability of the private sector to support manned missions to the Moon and Mars and earth science missions and applications. The report would be required to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science within 180 days of enactment of this Act.

A major component of the strategy for space exploration involves the use of nuclear power. Project Prometheus power and propulsion systems will enable human and robotics exploration, will enhance scientific capabilities, and will facilitate unprecedented levels of scientific return. In support of the future success of the program and improve efficiency, the Administrator should ensure that the Department of Energy national laboratories, with existing expertise in space nuclear reactor systems, be fully utilized in the execution of Project Prometheus and all of its missions including the Jupiter Icy Moons Orbiter mission. Furthermore, the Administrator should ensure that all aspects of this project are performed with full public involvement and participation.

Section 307. Reports on major systems.

Subsection (a) would require program managers for each major system, as determined by the Administrator, of the Solar System

Exploration Initiative to submit to the Administrator quarterly reports on the total life cycle costs for each major system. Any system that exceeds cost limitations would be required to submit a report on the cost overruns along with schedule and performance impacts to the Administrator.

Subsections (b) and (c) would require certain reporting by the Administrator to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science if the life cycle cost overruns exceed more than 15 and 25 percent. Also, if cost overruns exceed 15 percent, the Administrator would not obligate any additional funds unless a report is submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science identifying causes of the cost overruns, responsible persons, any previous programmatic changes made which affected cost overruns, corrective actions to be taken, identifies principal contractors, and relevant documents and testimonies submitted to Congress on the major system in question.

If cost overruns exceed 25 percent, the Administrator would not obligate any additional funds unless a certification is submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science stating the importance of the major system to the Exploration Initiative, no alternatives exist, new estimates are reasonable, and that management structure is adequate to manage and control costs.

This program of cost controls is modeled on “Nunn-McCurdy” Amendment to the Department of Defense Authorization Act of 1982, and was a successful management tool used in the development of weapons systems.

Section 308. International cooperation.

Subsection (a) would require the Administrator, in cooperation with the Department of State and other appropriate agencies, to submit a report to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science identifying any opportunities for the U.S. to enter into international partnerships on a human mission to the Moon or Mars within 180 days

Subsection (b) would make it a finding of the Congress that international cooperation on a robust ISS program is essential in building relations and commitments for the joint international pursuit of human exploration of the solar system. The Administrator would also be required to ensure that NASA fully complies with all its commitments with its international partners on the ISS. The Administrator would be required to submit a report on various options for increasing the crew size of the ISS to as many as six. The report would assess each option for cost, potential schedule, and logistics requirements.

Section 309. Technology transfer and licensing office.

Subsection (a) would require the Administrator to establish a Technology Transfer and Licensing Office within the Exploration Initiative to facilitate the transfer of technologies into and out of NASA, and to handle licensing activities of NASA. This office is already operating within the Exploration Systems program. Subsections (b) and (c) would require the Administrator to develop a

technology transfer plan to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science within one year of enactment of this Act.

Section 310. Robotic lunar missions.

Section 310 would require the Administrator to submit a plan to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science for robotic lunar missions to the Moon within three years. The plan would include the science and technical goals, the role of scientific peer review in selecting missions, and the use of the private sector to accomplish the goals of the mission.

Section 311. Legal aspects of lunar exploration.

Section 311 would require the Administrator, in consultation with the Secretary of State, to submit a legal review and interpretation of laws and treaties governing the exploration of space and the possible ownership of resources on the Moon and Mars. The review would be submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science within 90 days of this Act.

Section 312. NASA engineering school.

Subsection (a) would require the Administrator to establish an NASA Engineering School for NASA employees and contractors to increase knowledge of engineering and scientific principles for furthering the mission of NASA. Subsection (b) would identify the purpose of the school as to provide a unique training experience to bridge the gap between the broad-based training provided by universities, and the specific training needed to understand the different technologies which form the basis for work at NASA.

Subsection (c) would require the Administrator to submit, within 180 days after the date of enactment of this Act, to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science a plan to establish the engineering school.

In addition to the engineering school, the Committee believes the agency would benefit from the establishment of a virtual NASA Space Academy. The NASA Space Academy would consist of a consortium of 5–7 core schools of Earth and Space Exploration, competitively awarded. Its primary objective would be to meet challenges associated with research based education/training of transdisciplinary “explorer.” Network would also collaborate to assist in advancing K–12 education relative to space exploration. Institutions would be responsible for the cost of infrastructure and programs. NASA would be responsible for investments in research, training, and outreach and the network itself.

Section 313. Continuity of U.S. human space flight.

Subsection (a) would make it a finding of Congress that a gap or one or more years in the United States’ capability to transport astronauts to and from space is inconsistent with policy objectives of the U.S. space human space flight program. Subsection (b) would require the Administrator to, within one year, submit a report to the Senate Committee on Commerce, Science, and Transportation

and the House Committee on Science on requirements for enabling the extension of Shuttle operations and maintenance until project Constellation exploration Transportation System has been tested with humans. The report would also include estimates of costs and scheduling.

Subsection (c) would make it a the Sense of the Senate that NASA shall take all necessary steps to have a human rated vehicle to provide access to space operational before ceasing operations of the Space Shuttle and that taking such steps should not impede the development of the Crew Exploration Vehicle.

TITLE IV—MISCELLANEOUS

Section 401. Integrated financial management program.

Section 401 would require the Chief Financial Officer to submit a report to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science on NASA's ability to improve its financial management, including a status report on the implementation of the integrated financial management program and a description of plans and architecture for the full implementation of the management system.

Section 402. Future launch plan.

Section 402 would require the Administrator to submit a plan to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science for future launches of space vehicles, including estimates of costs, schedules, and factors relevant to other U.S. space sectors. The plan would be required to be submitted within 180 days of enactment of this Act.

Section 403. Commercial goods and services.

Section 403 provides a Sense of the Congress that NASA should purchase commercially available space goods and services to the fullest extent feasible to support human missions to the Moon and Mars.

Section 404. Industry advisory board.

Section 404 would require the Administrator to establish an Industry Advisory Board to review opportunities for the private sector to invest and take advantage of activities in NASA. The Board would be required to meet twice a year with the Administrator or his designee.

Section 405. Requirements for independent cost analysis.

Section 405 would amend section 301 of Public Law No. 106-391 (National Aeronautics and Space Administration Act of 2002) to adjust the total project cost level from \$150,000,000 to \$250,000,000. The new level is the amount at which the Chief Financial Officer would have to conduct and consider an independent life cycle cost estimate and report the results to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science. This section also would define total project costs. This change was recommended by NASA.

Section 406. Centennial challenge program.

Section 406 would amend the National Aeronautics and Space Act of 1958 to allow for the establishment of the Centennial Challenge Program. The program would award prizes for innovation in basic and applied research, technology development, and prototype demonstrations that have application for NASA's space and aeronautics activities. The section also would require that prize winners be selected through a competitive process; contestants assume any and all risks for any injury, death, damage, or loss of property, revenue, or profits; and no competition may result in more than \$1 million in cash without Administrator approval.

A Centennial Challenge Trust Fund would be established such that funding for competitions may be deposited. The Administrator would not be able to deposit more than \$25 million annually into the Fund.

Section 407. Cultural and organization assessment.

Subsection (a) would require the Administrator to conduct a NASA-wide assessment to identify and define areas of cultural and organizational changes and develop a NASA-wide plan to: (1) create a culture that promotes effective communication and encourages expression of dissenting views; (2) increase NASA's focus on the human elements of management and organizational development; (3) develop and implement consistent procedures for leadership, management, employee training and skill development; and (4) create a robust system that institutionalizes checks and balances to ensure the maintenance of NASA's technical and safety standards.

Subsection (b) would require the Administrator to submit to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science a report on the assessment conducted under subsection (a) within 6 months after the date of enactment. The report would include areas identified for cultural and organizational changes and strategies and timelines for implementing the requirements of subsection (a).

Section 408. Sense of the Congress regarding competitive contracting.

Section 408 would provide a Sense of the Congress to encourage NASA to increase emphasis on competitive contracting as a means of improving the efficiency and economy of the government.

Section 409. Employees stationed in foreign countries.

Section 409 would amend the National Aeronautics and Space Act of 1958 by adding a new section, Section 319, similar to legislation secured by other non-Foreign Service agencies, such as the Department of Transportation, which would permit the Administrator to authorize the expenditure of appropriated funds for the payment of allowances and benefits to employees permanently assigned to foreign countries in a manner consistent with allowances authorized for individuals of a comparable grade covered by the Foreign Service Act. This section was requested by NASA.

Section 410. Hubble telescope.

Subsection (a) would require the Administrator to submit a plan to Senate Committee on Commerce, Science, and Transportation and the House Committee on Science on the future of the Hubble Space Telescope within 60 days after the issuance of the National Academy of Sciences' report on options for future servicing of the Hubble.

Subsection (b) would require the Administrator to evaluate all options for the repair and upgrade of the Hubble Space Telescope that will accomplish the objectives of the SM-4 servicing mission. If there are any changes to the objectives of the SM-4 servicing mission, the Administrator would be required to submit a report to the Congress on the changes.

Section 411. Confirmation requirement.

Section 411 would require that the Assistant Administrator for Legislative Affairs be appointed by the President and confirmed by the Senate.

Section 412. National aeronautics and space foundation.

Section 412 would require the Administrator to report on the advisability of establishing a charitable and nonprofit corporation to encourage private gifts of real and personal property or any income therefrom to benefit NASA and to further the public's knowledge of Earth and space. The report would be required to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Science within 90 days of enactment of this Act.

Section 413. Near-earth object survey.

Subsection (a) would amend Section 102 of the National Aeronautics and Space Act of 1958 (42 U.S.C. 2451) with a Congressional Declaration of Policy and Purpose that would declare that the general welfare and security of the United States require that the unique competence of the National Aeronautics and Space Administration in science and engineering systems be directed to detecting, tracking, cataloging, and characterizing near-Earth asteroids and comets in order to provide warning and mitigation of the potential hazard of those asteroids and comets striking the Earth.

Subsection (b) would require the Administrator to plan, develop, and implement a near-Earth object survey program to detect, track, catalog, and characterize the physical characteristics of near-Earth asteroids and comets that are 100 meters or more in diameter in order to assess the threat of such objects striking the Earth.

Subsection (c) would require the Administrator to transmit to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science a report, no later than the first February 28th occurring after the date of enactment of this Act and on each of the 5 succeeding anniversaries of such transmittal. The report would contain: (1) a summary of all activities of the Administration under subsection (b) during the preceding fiscal year; (2) a summary of all amounts obligated or expended by the Administration during such fiscal year for such activities; and (3) a detailed plan and budget request for each of the 5 fiscal years following the date on which the report is transmitted.

Section 414. Use of unmanned aerial vehicles in wildlife, environment, and other activities.

Subsection (a) would authorize the Administrator to conduct a program to evaluate the feasibility and advisability of the use of unmanned aerial vehicles in wildlife, environmental, and other appropriate activities. Subsection (b) would describe the type of activities which may be conducted under the program. Subsection (c) would authorize the participation of other federal department and agencies. Subsection (d) would authorize \$10 million of the funds authorized by the Act to be used for the unmanned aerial vehicle program.

Section 415. Expansion of authority for demonstration on enhanced-use lease of real property.

Section 415 would expand the NASA enhanced-use lease of real property demonstration project, as established in the National Aeronautics and Space Act of 1958, to include six NASA centers instead of two.

Section 416. National Aeronautics and Space Foundation.

This section would amend the National Aeronautics and Space Act of 1958 to authorize the establishment of a National Aeronautics and Space Foundation. The Foundation would be a charitable, non-profit corporation modeled after the National Park Foundation established by Congress in 1967. The purpose of the National Aeronautics and Space Foundation would be to encourage private gifts of real and personal property or any income therefrom or other interest therein for the benefit of, or in connection with, NASA, its activities or its services; and to further the public's knowledge of and inspiration by the Earth, the Earth's atmosphere, space, and celestial bodies in space, for current and future generations of Americans.

The section would also established the board of directors for the Foundation. The board would be comprised of six members for a term of six years. The board members would be appointed by the Administrator, in consultation with the chairman and ranking member of the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives Committee on Science. The board would be authorized to establish the by-laws of the organization. Members of the board would not be compensated.

The Foundation would have the powers and duties of a charitable and non-profit corporation provided under laws of the State (or District of Columbia) in which it is incorporated. The Foundation would be able to enter into contracts or grants, to execute instruments, and generally do any and all lawful acts necessary or appropriate to its purposes as approved by its board of directors. The Foundation would be able to receive, accept, solicit, hold, administer, and use any gifts, devises, or bequests of real or personal property or any income therefrom or other interest therein for the benefit of or in connection with NASA, its activities, or its services.

The Foundation would be exempt from all Federal, State, and local taxation. The Foundation would be authorized to contribute to local governments but not in excess of that which it would be obligated to pay if it was not tax exempt. Also, gifts and other transfers made to or for the use of the Foundation shall be regarded as

gifts, contributions, or transfers to or for the use of the United States.

The Administrator would be authorized to contract with the Foundation for the performance of the agencies' duties and activities. Neither NASA or its employees would be allowed to accept funds from the Foundation. The Foundation would also be prohibited from providing funds to directly supplement any program or activity of NASA or any other Federal agency.

The Committee held a hearing to review possibilities for private contributions and heard testimony on the possibilities for advertising. Proposals, some of them proprietary, have been submitted to NASA and the U.S. Government as far back as the early 1980s. These proposals entail providing a mechanism for tasteful advertising in conjunction with NASA manned and unmanned missions with the proceeds benefiting space exploration programs. The Committee heard data that suggests that a significant amount of funding might be raised per year through mechanisms such as advertising.

The Committee encourages the quick establishment of the Foundation and requests that it examine as a start the proposals for advertising which have been submitted over the past several decades. The Committee expects that NASA and its newly created Foundation would report back to the Committee regarding these advertising and additional possibilities for encouraging private sector contributions to the space program. Nonetheless, some members of the Committee remain skeptical about this scheme and encourage NASA to move forward cautiously keeping in mind the bounds of "good taste." In addition, the Foundation should not be used to fund projects and programs that the Congress has refused to authorize or fund.

The Committee has authorized NASA to begin the Centennial Challenges Program to establish prizes for space accomplishment, noting that significant recent accomplishments in space flight have been seen from the privately funded Ansari X-prize. The Committee requests NASA to assess the feasibility of establishing future prize programs in conjunction with the National Aeronautics and Space Foundation with some resources from that foundation supporting such future prizes.

TITLE V—AERONAUTICS RESEARCH AND DEVELOPMENT

Section 501. Findings.

Section 501 would identify key findings of this title concerning the history, the future, and the value of research and development in aeronautics at NASA.

Section 502. Environmental aircraft research and development initiative.

Subsection (a) would require the Administrator to submit to Congress a comprehensive plan for the development and demonstration of technologies that result in the following commercial aircraft performance characteristics: (1) noise levels; (2) fuel efficiency, including specific fuel consumption, lift to drag ratio, and structural weight fraction; and (3) emissions.

Subsection (b) would identify requirements for the plan described in subsection (a).

Section 503. Civil supersonic transport research and development initiative.

Subsection (a) would require the Administrator to submit to Congress a feasibility study addressing the need for, and economic viability of, the development and demonstration, in a relevant environment, of technologies to enable overland flight of supersonic civil transport aircraft with certain performance characteristics.

Subsection (b) would identify requirements for the study described in subsection (a).

Section 504. NASA aeronautics scholarships.

Subsection (a) would require the Administrator to establish a program of scholarships for full-time graduate students who are United States citizens and are enrolled in, or have been accepted by and have indicated their intention to enroll in, accredited Masters degree programs in aeronautical engineering at institutions of higher education (as defined in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001)). Each such scholarship would cover the costs of room, board, tuition, and fees, and may be provided for a maximum of 2 years.

Subsection (b) would require the Administrator to publish regulations governing the scholarship program not later than 1 year after the date of enactment of this Act.

Subsection (c) would require that students who have been awarded a scholarship under this section have the opportunity for paid employment at one of the NASA Centers engaged in aeronautics research and development during the summer prior to the first year of the student's masters degree program, and between the first and second year, if applicable.

Section 505. Annual report on funding of research and development and science relating to aeronautics.

Section 505 would require the Administrator to submit a report to Congress every year by November 30 that would contain the aggregate amount obligated and expended on research and development on aeronautics during the preceding fiscal year, and the aggregate amount obligated and expended on science and science-related activities on aeronautics during the previous fiscal year.

ADDITIONAL VIEWS OF SENATOR HOLLINGS

I applaud this bill as an attempt to achieve necessary reforms in human space flight and to endorse the results of the Columbia Accident Investigation Board regarding the management and institutional problems that exist at NASA. However, I have serious concerns about the redirection given to NASA by this Administration and the consequences, unintended though they may be, for the future of space in the nation's civil and economic endeavors.

Specifically, I applaud the measures the bill's provisions that:

- (1) endorse the results of the Columbia Accident Investigation Board regarding the Shuttle Return-to-Flight and other changes at NASA to improve the safety and technical engineering management of the agency;

- (2) authorize an expansion of robotic study and exploration of Earth's solar system;

- (3) call on NASA aggressively to pursue a new human crewed vehicle and safe concepts of space flight operation;

- (4) enhance the participation in space and ensure a new spirit of openness and inclusion of the space industry and other nations in NASA's exploration program;

- (5) establish, as a matter of policy, that it is contrary to the interests of the United States to have a sustained period of interruption in U.S. human space flight capabilities that would disrupt relationships with other nations, make industry investments uncertain, introduce discontinuities in science, risk the sustainability of the unique skills acquired over many years among human space flight managers and operations personnel, and allow anyone to question the preeminent status and role of the United States as the world's leader in human space flight operations and engineering; and

- (6) seek to improve NASA program and financial management.

But the bill does not go far enough in a number of areas and, in some, goes too far indeed. The bill endorses NASA's program for the next five years and then seeks to create a measure of control over NASA spending, priorities, and purposes that is illusory at best.

My own assessment of the cost of NASA's redirection is that it sacrifices more than NASA lets on, causing severe dislocations to long-standing NASA initiatives in basic physics, solar, Earth, and aeronautics research. Moreover, we do not know the final price tag of this shift in U.S. space policy, and future dislocations that may result.

While the Administration is undergoing a review of its space transportation policy, it has not yet announced which Federal agency will be responsible for U.S. space transportation in the future. We do not know how NASA's new program, focused narrowly on

deep space exploration “beyond low Earth orbit,” relates to the original broader purpose of the 1958 Space Act, to establish a single, U.S. civilian agency to oversee and sponsor all U.S. research, development, and technological advancement in aeronautics and space. If NASA and its \$15 billion budget will only be dedicated to planetary exploration and not these broader purposes, which agency will oversee and perform those activities and where will that funding come from? These are questions that all of us in Congress have asked ourselves and we do not have the answers.

Not only do we not have a price tag, we do not have a plan. I understand the impetus of those who want us to move out in this new direction, restoring credibility and sustainability to this pursuit; but I do not understand the urgency and impatience. In order to meet the third criteria set out by the President’s Commission on Implementation of U.S. Space Exploration Policy (aka the Aldridge Commission), affordability, I do not know how we can proceed to enact five years of funding for a program that hasn’t even been defined yet. As I have said before, this “go-as-you-pay” approach is merely a license to throw fiscal discipline out the window and drag out projects until they never finish, nothing more, nothing less.

Throughout the past year and a half, there have been two basic objectives in my approach to NASA and the future of U.S. space policy. The first is to rationally address the nation’s future ambitions in space, given the significance of the loss of the Space Shuttle Columbia and the healthy bout of soul-searching about the future that has engaged the nation. The second is to achieve a public accounting for the loss, without recrimination but with a steadfast resolve to ensure that the circumstances that led us here are never repeated again.

Sadly, I must say that I have failed in those causes. I cannot say that I believe the nation has taken the Columbia tragedy to heart, fully contemplating and addressing all the antecedents, circumstances, and causes of the failure of this institution, this program, and this vehicle. I and others, including the members of the Columbia Accident Investigation Board, believe that many of these root causes are mired in the circumstances of an agency pressed to accomplish too much with too little and as a result promising to do more than could humanly be delivered. It is not obvious to me, given the events that have occurred since the accident, that this cycle has been broken.

Second, it is not clear to me that NASA has fully learned the lessons of Columbia and, before it, the common set of lessons of the Challenger disaster. I hope, in coming and future years, that NASA is able and willing to step back more fully from these disasters, once the passion of re-flight is past, to listen even more deeply to what the safety, behavioral science, and organizational research community is trying to say about the demands of being an enduring, high reliability organization. No doubt, there is an impressive steadfastness to NASA’s recovery actions, but true reform is something more to achieve than a one or two year set of “behavioral adjustments” and re-flight events.

In order to achieve real reform, I believe NASA must make fundamental changes in its principles of management and in its organization, the distribution of its roles and responsibilities, and in the

performance of its functions of safety in flight operations, not just in its advisory processes of safety in development and engineering. This was a core theme in the recommendations of the Rogers Commission at the time of the Challenger disaster and should now be revisited.

Lastly, let none of these words discount the bravery and earnestness of astronauts and the operators, engineers, and safety officials who stand behind them. The strength of NASA and our space industry is its people. Together we can move NASA forward.

ERNEST HOLLINGS.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, the Committee states that the bill as reported would make no change to existing law.

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958

TITLE I—SHORT TITLE, DECLARATION OF POLICY, AND DEFINITIONS

* * * * *

SEC. 102. CONGRESSIONAL DECLARATION OF POLICY AND PURPOSE.

[42 U.S.C. 2451]

(a) The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind.

(b) The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States, except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility of, and shall be directed by, the Department of Defense; and that determination as to which such agency has responsibility for and direction of any such activity shall be made by the President in conformity with section 201(e).

(c) The Congress declares that the general welfare of the United States requires that the National Aeronautics and Space Administration (as established by title II of this Act) seek and encourage, to the maximum extent possible, the fullest commercial use of space.

(d) The aeronautical and space activities of the United States shall be conducted so as to contribute materially to one or more of the following objectives:

- (1) The expansion of human knowledge of the Earth and of phenomena in the atmosphere and space;
- (2) The improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles;

(3) The development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;

(4) The establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes;

(5) The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere;

(6) The making available to agencies directly concerned with national defense of discoveries that have military value or significance, and the furnishing by such agencies, to the civilian agency established to direct and control nonmilitary aeronautical and space activities, of information as to discoveries which have value or significance to that agency;

(7) Cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof;

(8) The most effective utilization of the scientific and engineering resources of the United States, with close cooperation among all interested agencies of the United States in order to avoid unnecessary duplication of effort, facilities, and equipment; and

(9) The preservation of the United States preeminent position in aeronautics and space through research and technology development related to associated manufacturing processes.

(e) The Congress declares that the general welfare of the United States requires that the unique competence in scientific and engineering systems of the National Aeronautics and Space Administration also be directed toward ground propulsion systems research and development. Such development shall be conducted so as to contribute to the objectives of developing energy- and petroleum-conserving ground propulsion systems, and of minimizing the environmental degradation caused by such systems.

(f) The Congress declares that the general welfare of the United States requires that the unique competence of the National Aeronautics and Space Administration in science and engineering systems be directed to assisting in bioengineering research, development, and demonstration programs designed to alleviate and minimize the effects of disability.

(g) The Congress declares that the general welfare and security of the United States require that the unique competence of the National Aeronautics and Space Administration in science and engineering systems be directed to detecting, tracking, cataloging, and characterizing near-Earth asteroids and comets in order to provide warning and mitigation of the potential hazard of those asteroids and comets striking the Earth.

[(g)] (h) It is the purpose of this Act to carry out and effectuate the policies declared in subsections (a), (b), (c), (d), (e), and (f).

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TITLE II—COORDINATION OF AERONAUTICAL AND SPACE ACTIVITIES

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SEC. 202. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.

(a) **ESTABLISHMENT; APPOINTMENT AND DUTIES OF ADMINISTRATOR.**—There is hereby established the National Aeronautics and Space Administration (hereinafter called the “Administration”). The Administration shall be headed by an Administrator, who shall be appointed from civilian life by the President by and with the advice and consent of the Senate. Under the supervision and direction of the President, the Administrator shall be responsible for the exercise of all powers and the discharge of all duties of the Administration, and shall have authority and control over all personnel and activities thereof.

(b) **DEPUTY ADMINISTRATOR; APPOINTMENT AND DUTIES.**—There shall be in the Administration a Deputy Administrator, who shall be appointed from civilian life by the President by and with the advice and consent of the Senate and shall perform such duties and exercise such powers as the Administrator may prescribe. The Deputy Administrator shall act for, and exercise the powers of, the Administrator during his absence or disability.

(c) **RESTRICTION ON ENGAGING IN ANY OTHER BUSINESS, VOCATION, OR EMPLOYMENT.**—The Administrator and the Deputy Administrator shall not engage in any other business, vocation, or employment while serving as such.

(d) **ASSISTANT ADMINISTRATOR FOR LEGISLATIVE AFFAIRS.**—*There shall be in the Administration an Assistant Administrator for Legislative Affairs, who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall perform such duties as the Administrator may prescribe.*

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TITLE III—MISCELLANEOUS

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SEC. 301. INDEPENDENT LIFE-CYCLE COST ANALYSIS.

[42 U.S.C. 2459G]

(a) **REQUIREMENT.**—[Before any funds may be obligated for Phase B of a project that is projected to cost more than \$150,000,000 in total project costs, the Chief Financial Officer for the National Aeronautics and Space Administration shall conduct an independent life-cycle cost analysis of such project and shall report the results to Congress.] *For each project that is projected to cost more than \$250,000,000 in total project costs, the Chief Financial Officer for the National Aeronautics and Space Administration shall conduct and consider an independent life-cycle cost analysis and report the results of that analysis to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science as soon as practicable after the contract, or contracts, for the project have been awarded. In developing cost accounting and reporting standards for carrying out this section, the Chief Financial Officer shall, to the extent practicable*

and consistent with other laws, solicit the advice of expertise outside of the National Aeronautics and Space Administration.

[(b) DEFINITION.—For purposes of this section, the term “Phase B” means the latter stages of project formulation, during which the final definition of a project is carried out and before project implementation (which includes the Design, Development, and Operations Phases) begins.]

(b) *TOTAL PROJECT COSTS.*—*In this section, the term “total project costs” includes—*

(1) all activity in the life cycle of a program or project after preliminary design, independent assessment of the preliminary design, and approval to proceed into implementation; and

(2) design, development, testing, certification, launch, operations, and disposal.

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SEC. 315. ENHANCED-USE LEASE OF REAL PROPERTY DEMONSTRATION.

[42 U.S.C. 2459J]

(a) IN GENERAL.—Notwithstanding any other provision of law, the Administrator may enter into a lease under this section with any person or entity (including another department or agency of the Federal Government or an entity of a State or local government) with regard to any real property under the jurisdiction of the Administrator at no more than [two (2)] 6 National Aeronautics and Space Administration (NASA) centers.

(b) CONSIDERATION.—

(1) A person or entity entering into a lease under this section shall provide consideration for the lease at fair market value as determined by the Administrator, except that in the case of a lease to another department or agency of the Federal Government, that department or agency shall provide consideration for the lease equal to the full costs to NASA in connection with the lease.

(2) Consideration under this subsection may take one or a combination of the following forms—

(A) the payment of cash;

(B) the maintenance, construction, modification or improvement of facilities on real property under the jurisdiction of the Administrator;

(C) the provision of services to NASA, including launch services and payload processing services; or

(D) use by NASA of facilities on the property.

(3)(A) The Administrator may utilize amounts of cash consideration received under this subsection for a lease entered into under this section to cover the full costs to NASA in connection with the lease. These funds shall remain available until expended.

(B) Any amounts of cash consideration received under this subsection that are not utilized in accordance with subparagraph (A) shall be deposited in a capital asset account to be established by the Administrator, shall be available for maintenance, capital revitalization, and improvements of the real

property assets of the centers selected for this demonstration program, and shall remain available until expended.

(c) **ADDITIONAL TERMS AND CONDITIONS.**—The Administrator may require such terms and conditions in connection with a lease under this section as the Administrator considers appropriate to protect the interests of the United States.

(d) **RELATIONSHIP TO OTHER LEASE AUTHORITY.**—The authority under this section to lease property of NASA is in addition to any other authority to lease property of NASA under law.

(e) **LEASE RESTRICTIONS.**—NASA is not authorized to lease back property under this section during the term of the out-lease or enter into other contracts with the lessee respecting the property.

(f) **PLAN AND REPORTING REQUIREMENTS.**—At least 15 days prior to the Administrator entering into the first lease under this section, the Administrator shall submit a plan to the Congress on NASA's proposed implementation of this demonstration. The Administrator shall submit an annual report by January 31st of each year regarding the status of the demonstration.

SEC. 316. AUTHORITY FOR COMPETITIVE PRIZE AWARD PROGRAM TO ENCOURAGE DEVELOPMENT OF ADVANCED SPACE AND AERONAUTICAL TECHNOLOGIES.

(a) **PROGRAM AUTHORIZED.**—*The Administrator may carry out a program, known as the Centennial Challenge Program, to award prizes to stimulate innovation in basic and applied research, technology development, and prototype demonstration that have the potential for application to the performance of the space and aeronautical activities of the Administration.*

(b) **PROGRAM REQUIREMENTS.**—

(1) **COMPETITIVE PROCESS.**—*Recipients of prizes under the program under this section shall be selected through one or more competitions conducted by the Administrator.*

(2) **ADVERTISEMENT OF COMPETITIONS.**—*The Administrator shall widely advertise any competitions conducted under the program.*

(c) **REGISTRATION; ASSUMPTION OF RISK.**—

(1) **REGISTRATION.**—*Each potential recipient of a prize in a competition under the program under this section shall register for the competition.*

(2) **ASSUMPTION OF RISK.**—*In registering for a competition under paragraph (1), a potential recipient of a prize shall assume any and all risks, and waive claims against the United States Government and its related entities (including contractors and subcontractors at any tier, suppliers, users, customers, cooperating parties, grantees, investigators, and detailees), for any injury, death, damage, or loss of property, revenue, or profits, whether direct, indirect, or consequential, arising from participation in the competition, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct.*

(d) **BUDGETING AND AWARDING OF FUNDS.**—

(1) **AVAILABILITY OF FUNDS.**—*Any funds appropriated to carry out this section shall remain available until expended, but for not more than 4 fiscal years.*

(2) *DEPOSIT AND WITHDRAWAL OF FUNDS.*—When a prize is offered, the total amount of funding made available for that prize shall be deposited in the Centennial Challenge Trust Fund. If funding expires before a prize is awarded, the Administrator shall deposit additional funds in the account to ensure the availability of funding for all prizes. If a prize competition expires before its goals are met, the Administrator may redesignate those funds for a new challenge, but any redesignated funds will be considered as newly deposited for the purposes of paragraph (3). All cash awards made under this section shall be paid from that account.

(3) *OVERALL LIMIT.*—The Administrator may not deposit more than \$25,000,000 annually in the Centennial Challenge Trust Fund.

(4) *MAXIMUM PRIZE.*—No competition under the program may result in the award of more than \$1,000,000 in cash prizes without the approval of the Administrator.

(e) *RELATIONSHIP TO OTHER AUTHORITY.*—The Administrator may exercise the authority in this section in conjunction with or in addition to any other authority of the Administrator to acquire, support, or stimulate basic and applied research, technology development, or prototype demonstration projects.

SEC. 317. AUTHORITY TO PAY ALLOWANCES AND BENEFITS TO EMPLOYEES STATIONED IN FOREIGN COUNTRIES.

(a) *IN GENERAL.*—The Administrator, in the Administrator's discretion, may provide to civilian and military personnel, if the duty station of such personnel is outside the United States, allowances and benefits comparable to those provided by the Secretary of State to officers and employees of the Foreign Service under chapter 9 of title I of the Foreign Service Act of 1980 (22 U.S.C. 4081 et seq.).

(b) *REGULATIONS.*—The Administrator shall issue such regulations as may be necessary to implement this section. Such regulations shall take effect with respect to members of a uniformed service only to the extent that the head of the executive department of which that uniformed service is a part has concurred in the application of the regulations to members of that uniform service. The regulations shall ensure that no person receives allowances or benefits under both this section and any other provision of law for the same purpose.

(c) *RELATIONSHIP TO OTHER AUTHORITY.*—The authority granted to the Administrator by this section is in addition to authority granted to the Administrator by any other provision of law, and nothing in this section shall be construed to impair or otherwise affect the authority of the Administrator under any other provision of law.

(d) *FUNDING.*—Funds appropriated to the Administration shall be available for obligation and expenditure to carry out this section.

(e) *DEFINITIONS.*—In this section:

(1) *UNITED STATES.*—The term "United States" means the 50 States and the District of Columbia.

(2) *CIVILIAN PERSONNEL.*—The term "civilian personnel" means civilian officers and employees of the United States Government employed by, or assigned or detailed to, the Administration.

(3) *MILITARY PERSONNEL.*—The term “military personnel” means members of the uniformed services assigned or detailed to the Administration.

(4) *UNIFORMED SERVICES.*—The term “uniformed services” has the meaning given that term in section 101 of title 10, United States Code.

(f) *TAXATION.*—Section 912(a) of the Internal Revenue Code of 1986 shall apply with respect to amounts received by civilian personnel or military personnel as allowances or otherwise under this section in the same manner as it applies with respect to amounts received by civilian officers or employees as allowances or otherwise under chapter 9 of title I of the Foreign Service Act of 1980.

SEC. 318. NATIONAL AERONAUTICS AND SPACE FOUNDATION.

(a) *IN GENERAL.*—There is established a charitable and nonprofit corporation to be known as the National Aeronautics and Space Foundation.

(b) *PURPOSES.*—The purposes of the foundation are—

(1) to encourage private gifts of real and personal property or any income therefrom or other interest therein for the benefit of, or in connection with, NASA, its activities, or its services; and

(2) to further the public’s knowledge of and inspiration by the Earth, the Earth’s atmosphere, space, and celestial bodies in space, for current and future generations of Americans.

(c) *BOARD OF DIRECTORS.*—

(1) *IN GENERAL.*—The Foundation shall be governed by a board of directors of 6 individuals appointed by the Administrator, in consultation with the chairman and ranking member of the Senate Committee on Commerce, Science, and Transportation and of the House of Representatives Committee on Science. The Administrator shall designate 1 member to serve as chair.

(2) *TERM OF OFFICE.*—Each member shall serve for a term of 6 years, except that of the members first appointed to the board—

(A) 1 member shall be appointed for a term of 1 year;

(B) 1 member shall be appointed for a term of 2 years;

(C) 1 member shall be appointed for a term of 3 years;

(D) 1 member shall be appointed for a term of 4 years;

(E) 1 member shall be appointed for a term of 5 years;

and

(F) 1 member shall be appointed for a term of 6 years.

(3) *VACANCIES.*—An individual appointed to fill a vacancy occurring other than by the expiration of a term shall be appointed for the remainder of the term of the former member the individual succeeds.

(4) *STATUS.*—Membership on the Board shall not be deemed to be an office within the meaning of the statutes of the United States.

(5) *ADMINISTRATOR TO SERVE EX OFFICIO.*—The Administrator shall be a member of the board ex officio but without the right to vote.

(6) *BY-LAWS.*—Upon the appointment and qualification of all members of the board, the board may by majority vote adopt by-laws, adopt an official seal (which shall be judicially recog-

nized), and establish a schedule for meetings and a mechanism for calling non-scheduled meetings. Except as provided in the preceding sentence and unless modified by the Board—

(A) a majority of the members serving shall constitute a quorum; and

(B) the board shall meet at least once each year and at the call of the chair.

(7) *COMPENSATION AND EXPENSES.*—No compensation shall be paid to the members of the Board for their services as members, but they shall be reimbursed for actual and necessary traveling and subsistence expenses incurred by them in the performance of their duties as such members out of Foundation funds available to the Board for such purposes.

(d) *POWERS AND DUTIES.*—

(1) *IN GENERAL.*—Except as otherwise provided in this section, the Foundation shall have the powers of, and be subject to the limitations of, a charitable and nonprofit corporation provided under the laws of the State (or the District of Columbia) in which it is incorporated.

(2) *PERPETUAL SUCCESSION; MEMBER LIABILITY.*—The Foundation shall have perpetual succession, with all the usual powers and obligations of a corporation acting as a trustee, including the power to sue and to be sued in its own name, but the members of the Board shall not be personally liable, except for malfeasance.

(3) *CONTRACTS; GRANTS; OTHER INSTRUMENTS.*—The Foundation shall have the power to enter into contracts or grants, to execute instruments, and generally to do any and all lawful acts necessary or appropriate to its purposes as approved by the board.

(4) *GIFTS; DEVISES; BEQUESTS.*—

(A) *IN GENERAL.*—Except as provided in subparagraph (B), the Foundation may accept, receive, solicit, hold, administer, and use any gifts, devises, or bequests, either absolutely or in trust, of real or personal property or any income therefrom or other interest therein for the benefit of or in connection with, NASA, its activities, or its services, including a gift, devise, or bequest that is encumbered, restricted, or subject to beneficial interests of private persons if any current or future interest therein is for the benefit of NASA, its activities, or its services. For purposes of this paragraph, an interest in real property includes easements or other rights for preservation, conservation, protection, or enhancement by and for the public of natural, scenic, historic, scientific, educational, inspirational, or recreational resources.

(B) *LIMITATION.*—The Foundation may not accept a gift, devise, or bequest which entails any expenditure other than from the resources of the Foundation.

(e) *TAX STATUS AND FUNCTIONS.*—

(1) *TAX-EXEMPT STATUS OF FOUNDATION.*—The Foundation and any income or property received or owned by it, and all transactions relating to such income or property, shall be ex-

empt from all Federal, State, and local taxation with respect thereto.

(2) *IN-LIEU-OF PAYMENTS.*—*The Foundation may, in the discretion of the board—*

(A) *contribute toward the costs of local government in amounts not in excess of those which it would be obligated to pay such government if it were not exempt from taxation under paragraph (A) or by virtue of its being a charitable and nonprofit corporation; and*

(B) *may contribute with respect to property transferred to it and the income derived therefrom if such agreement is a condition of the transfer.*

(3) *DEDUCTIBILITY OF CONTRIBUTIONS TO FOUNDATION.*—*Gifts and other transfers made to or for the use of the Foundation shall be regarded as contributions, gifts, or transfers to or for the use of the United States.*

(f) *COOPERATIVE WORK WITH NASA.*—

(1) *NASA SUPPORT CONTRACTS.*—*The Administrator may contract with the Foundation for the performance of its duties and activities in support of the Administration.*

(2) *NASA MAY NOT ACCEPT FUNDS FROM FOUNDATION.*—*Neither NASA nor any employee thereof may be authorized to accept funds from the Foundation.*

(3) *FOUNDATION FUNDING MAY NOT SUPPLEMENT APPROPRIATED FUNDS ACTIVITIES.*—*Except as otherwise specifically provided by statute, the Foundation may not obligate or expend funds to directly supplement any program or activity of NASA, or any other Federal agency, for which appropriated funds may be obligated or expended.*

(g) *DEFINITIONS.*—*In this section:*

(1) *ADMINISTRATOR.*—*The term “Administrator” means the Administrator of the National Aeronautics and Space Administration.*

(2) *BOARD.*—*The term “board” means the board of directors of the Foundation.*

(3) *FOUNDATION.*—*The term “Foundation” means the National Aeronautics and Space Foundation established by subsection (a).*

(4) *NASA.*—*The term “NASA” means the National Aeronautics and Space Administration.*

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TITLE V—SOLAR SYSTEM EXPLORATION

SEC. 501. SOLAR SYSTEM EXPLORATION INITIATIVE.

(a) *IN GENERAL.*—*The Administrator of the National Aeronautics and Space Administration shall establish a program—*

(1) *to implement a sustained and affordable human and robotic exploration of the solar system and beyond;*

(2) *to extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;*

(3) *to develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and*

(4) *to promote international and commercial participation in exploration to further United States scientific, security, and economic interests.*

(b) *ACTION REQUIRED.—To accomplish the goals of the program, the Administrator shall—*

(1) *return the Space Shuttle to flight consistent with safety concerns and the recommendations of the Columbia Accident Investigation Board, with the chief purpose to help finish assembly of the International Space Station;*

(2) *retire the Space Shuttle as soon as assembly of International Space Station is completed;*

(3) *begin developing a new crewed exploration vehicle to explore beyond Earth orbit to be ready for testing by the end of the decade, and to conduct its first human mission no later than 2014; and*

(4) *take the steps necessary to return humans to Earth's moon as early as 2015 and no later than 2020, and use the Moon as a stepping-stone for missions to Mars and other destinations in space.*

